

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平10-318955

(43) 公開日 平成10年(1998)12月4日

(51) Int.Cl.⁶

G 0 1 N 25/72

識別記号

F I

G 0 1 N 25/72

Y

審査請求 未請求 請求項の数3 O L (全 6 頁)

(21) 出願番号 特願平9-124167

(22) 出願日 平成9年(1997)5月14日

(71) 出願人 591101504

クノール食品株式会社

神奈川県川崎市高津区下野毛2丁目12番1号

(71) 出願人 000000066

味の素株式会社

東京都中央区京橋1丁目15番1号

(72) 発明者 倉谷 隆博

神奈川県川崎市川崎区鈴木町1-1 味の素株式会社生産技術研究所内

(74) 代理人 弁理士 霜越 正夫 (外1名)

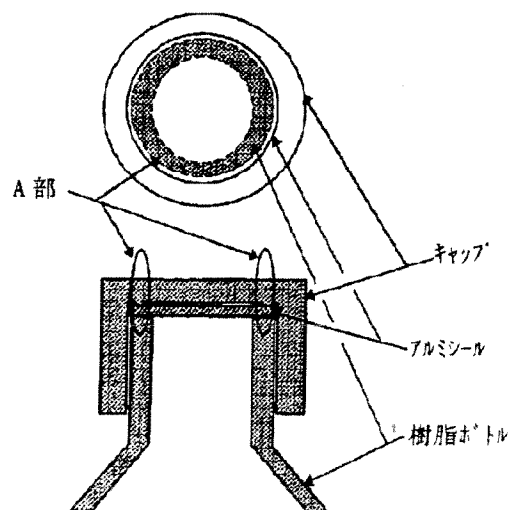
最終頁に続く

(54) 【発明の名称】 高周波アルミシールの非接触検査法

(57) 【要約】

【課題】樹脂製容器（ボトル）に内容物を充填し、アルミシール（中蓋）をいれた外蓋をこれに装着し、高周波シーラ一下を通過させ、アルミシールを非接触加熱して容器開口部上縁に融着させた際の融着シールの良否が簡便にしかも全数検査が極めて容易に行うことができる方法の提供。

【解決手段】高周波誘導加熱処理に引き続いて前記キャップ上面を赤外線熱画像カメラで撮影し、得られた赤外線画像の形状または熱画像を処理して得たヒストグラムに基づいてアルミシールの良否を判定する。



【特許請求の範囲】

【請求項1】樹脂製容器開口部のドーナツ形状上縁に少なくとも合成樹脂成形部材とその上にアルミニウム箔等の金属片の中蓋を置き、これをねじ込み式の樹脂製外蓋で前記容器開口部上縁に圧接し、この状態で高周波誘導加熱に付して前記金属片の発熱により、下面に圧接された合成樹脂成形部材を部分熔融して前記容器開口部ドーナツ形状上縁に加熱融着させた場合に、前記高周波誘導加熱処理に引き続いて前記キャップ上面を赤外線熱画像カメラで撮影し、得られた赤外線熱画像の形状及び／又はデータ解析に基づいてアルミシールの良否を判定することを特徴とする高周波アルミシールの非接触検査法。

【請求項2】中蓋が少なくとも合成樹脂成形部材とその上にアルミニウム箔等の金属片が接着剤で接着された中蓋であることを特徴とする請求項1記載の高周波アルミシールの非接触検査法。

【請求項3】データ解析が1)計測された全温度の内、一定以上の高温値の検出、2)樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状の長軸及び単軸方向の長さの比又は形状異常による検出、3)樹脂製容器開口部のドーナツ形状上縁に形成された熱溶着部ドーナツ形状の樹脂製容器の流れ方向の中心線の温度分布検出、4)樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状のドーナツ形中心線の温度分布検出の少なくとも一つを用いることを特徴とする請求項1記載の高周波アルミシールの非接触検査法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、高周波アルミシールの非接触検査法、より詳しくは、少なくともアルミニウム箔及び合成樹脂成形部材で構成される容器中蓋を高周波誘導加熱によりアルミニウム箔でシールした場合のシールの良否を外蓋上面から得られる赤外線熱画像から直接にまたはこのような赤外線熱画像をデータ処理して得られるヒストグラムから判定する高周波アルミシールの非接触検査法に関する。

【0002】

【従来の技術】従来、赤外線を利用した検査法には、例えば、特開昭62-28650「異物付着有無の検査方法」や特開平7-101423「包装容器接着検査装置」が知られている。詳述すれば、前者は、被検査物に外部から熱変化を与え、被検査物の異物付着部が他部と異なる熱容量のため生じる温度差を赤外線検出器で測定することにより、食品のブリスタ包装製品の容器上蓋内面への充填物の付着を間接的に自動判定する、というものであり、そして後者は、ホットメルト接着部位を有する包装容器の上面と両側面とから放射される赤外線を赤外線放射温度計で検知することにより、包装容器の接着箇所の接着不良を包装容器の外方から非接触で検査可能

にする、というものである。これらは、赤外線熱画像を利用する点においては本発明とは共通するものの、検査の対象（検査箇所）やとらえる赤外線（源）の相違などから、後に説明するところから理解されるように、本発明とは全く異なる。

【0003】マヨネーズ、ドレッシング、トマトケチャップ、醤油、ソースなど液状、粉状又は顆粒状の調味料が、大は1kg以上にも及ぶ大容量の、そして小は100g以下の小容量の非金属材料の樹脂製容器（ボトル）に充填され、容器開口部はねじ込み式の同じく非金属材料の樹脂製キャップ（外蓋）で蓋をされた形態で流通におかれている。これらの製品は、流通過程において、安全上の見地や消費者の受ける衛生上の印象の点から、中蓋を備えることが望まれる。

【0004】このような中蓋としては、高周波誘導アルミニウム箔の加熱によるシール方法がある。すなわち、例えば、接着剤層を介してポリエチレンフィルムなどの熱溶融性樹脂フィルムを積層したアルミニウム箔（以下アルミシール積層材と言うこともある）を、中身を充填した容器の開口部のドーナツ型上縁を覆うようにドーナツ型上縁の外径より若干大きい（好ましくは、後に開封時中蓋を取り除くときに取り除きやすいようにタブを付けた）円形にカットし、このカット片を熱融着性樹脂フィルムの面を下にして容器開口部を覆い、この上から（好ましくは、内側底にアルミニウム箔を容器開口部上縁によく圧接できるようなドーナツ状の突条を備えた）樹脂製外蓋（キャップ）をねじ込み、この状態で高周波誘導加熱シーラーを通す。各部の関係の概念図を図1に示す。

【0005】このように、高周波シーラーを通した際、アルミニウム箔の円形カット片の外縁内側部分に渦電流が流れ、この渦電流でアルミニウムの箔が加熱される。アルミニウム箔のカット片（アルミシール）は外蓋（キャップ）（の内側底に設けられた突条）でボトル（容器）開口部のドーナツ型上縁に押さえつけられており、アルミシールで発生した熱は、アルミシールが接触している部分（図2のAの部分）のボトルの樹脂を溶かし、後に自然冷却にて溶けた樹脂が固まる。これによって、アルミシール（中蓋）がボトル開口部に接着し、そのうえに外蓋が締まっている製品が完成する。

【0006】しかしながら、このようにして行う高周波誘導加熱シールは、必ずしも常に良好に行われるとは限らず、キャップ（上蓋）の緩み、斜めキャップ、アルミシールの2枚重ね、加熱温度の低すぎ、加熱温度の高過ぎ、シール部への内容物（中身）の付着、シール面の切り欠け、アルミシールなし、等の理由による不完全な欠陥シールが生ずることがある。

【0007】そこで、例えば、ベルトコンベアを利用して、樹脂製容器への中身（内容物）の充填、容器開口部のドーナツ形上縁にアルミニウム箔の円形中蓋を置き、

これをねじ込み式の外蓋（キャップ）で前記容器開口部上縁に圧接し、この状態で高周波誘導加熱に付して前記アルミニウム箔を前記容器開口部上縁に高周波加熱融着をすることで密栓をした製品を連続的に製造する生産ライン上で前記のようなシールの不完全な製品を簡便に検出することができて、このような製品（不良品）を排除することのできるものが強く望まれている。

【0008】

【発明が解決しようとする課題】従って、本発明は、前項記載の従来技術の背景下に、上に説明したような高周波アルミシールにおける欠陥を簡便に検出する方法を提供することを目的とする。

【0009】

【課題を解決するための手段】本発明者は、前項記載の目的を達成すべく鋭意研究の結果、樹脂製容器開口部ドーナツ形状上縁にアルミシール中蓋をいれた蓋（外蓋）を装着し、高周波シーラー下を通過させ、アルミシール積層材を非接触加熱し、そのうちの下層の熱融性樹脂を容器口部ドーナツ形上縁に融着させる際、アルミシール箔部で発生した熱が該ドーナツ形状の融部つまりシール状況を外蓋を通してその外側表面に伝わるが、熱伝導された様子を赤外線カメラにて赤外線の熱画像として非接触で取り込み、これを画像検査処理装置にて上蓋外表面の温度分布をカラーで再現し、この形状と解析したデータからアルミシールが良好な状態で接着されたか否かを容易に判別できることを見出し、このような知見に基づいて本発明を完成するに至った。

【0010】すなわち、本発明は樹脂製容器開口部のドーナツ形状上縁に少なくとも合成樹脂成形部材とその上にアルミニウム箔等の金属片の中蓋を置き、これをねじ込み式の樹脂製外蓋で前記容器開口部上縁に圧接し、この状態で高周波誘導加熱に付して前記金属片の発熱により、下面に圧接された合成樹脂成形部材を部分溶融して前記容器開口部ドーナツ形状上縁に加熱融着させた場合に、前記高周波誘導加熱処理に引き続いて前記キャップ上面を赤外線熱画像カメラで撮影し、得られた赤外線熱画像の形状及び／又はデータ解析に基づいてアルミシールの良否を判定することを特徴とする高周波アルミシールの非接触検査法である。

【0011】

【発明の実施の形態】以下、本発明を詳細に説明する。

【0012】樹脂製容器開口部のドーナツ型上縁に合成樹脂成形部材とその上にアルミニウム箔等の金属片（アルミシール積層材）の中蓋を置き、これをねじ込み式の樹脂製外蓋（キャップ）で前記容器開口部上縁に圧接し、この状態で高周波誘導加熱に付して前記アルミニウム箔の下面に位置した合成樹脂成形部材を前記容器開口部上縁に高周波加熱融着をすること自体は適宜従来法によることができる。

【0013】赤外線熱画像カメラで物体の表面を撮影

し、得られた熱画像をデータ処理して前記物体の表面の温度分布を例えばカラーで表示し（高温部は赤、低温部は青、そして中間部は黄色というように）、あるいはヒストグラムで表示することは、市販の赤外線カメラ、データ処理、ディスプレイなどのシステムからなる装置を適宜使用することが出来る（例えば、日本電気（株）赤外放射温度計「サーモレーサ」、三菱電機（株）高速熱画像解析装置「三菱サーマルイメージャ」、日本アビオニクス（株）赤外線熱画像装置（TVSシリーズ）、日本電子（株）赤外線温度解析装置「サーモビュー」（JTG-6000シリーズ）、等）。

【0014】本発明で用いられる高周波発振器は市販の装置を用いることができる。例えば、島田理化（株）製「高周波発振器SST-20」が好んで用いられる。

【0015】本発明の特徴は高周波発振により金属片（アルミニウム箔）に発生した熱により、該金属片下面に積層された合成樹脂成形部材の一部が溶融し、樹脂製容器口部のドーナツ形上縁がシールされた際発生した熱を、外蓋裏面を通して外蓋外側上面に熱伝導された熱分布を上部より赤外線熱画像カメラでとらえ、得られた赤外線熱画像データを処理して外蓋外側上面の温度分布をカラー表示し、またはヒストグラム解析し（図1に、これらの、データ処理による表示は、リアルタイムで行われ得ることは周知の通りである）、これらの表示又は解析を基に良好にシールされた製品の場合のそれらと比較して一致すればシール良好と判定し、そして一致しなければシール不良と判定することや又基準となるデータを設定しておき異常値を検出することでシール性を非接触的に検査することにある。

【0016】図2により、これをより具体的に説明する。図2はアルミシール加熱時のキャップ（外蓋）上面への熱伝導とこれを上部よりキャップに向かって赤外線熱画像カメラで捕らえたヒストグラフを示すものである。アルミシールで発生した熱は、キャップの部分（図2のAの部分）にも伝わり、キャップ上部から赤外線熱画像カメラで見るとドーナツ形状部分の温度がドーナツ内側の温度より高いことが分かる。温度分布の形でシール性の接着状況をかなり正確に判断することができる。

【0017】つまり、図2に示すようなきれいなドーナツの形が観察された場合は（ただし、アルミニウム箔の中蓋にタブが付いているときは、ドーナツ型画像の外縁にそれによる若干の欠けが入る）、良好なアルミシールが施された、と判断でき、それ以外の形が観察された場合は、形によって、（1）キャップ（外蓋）が充分に締まっておらずアルミシール（中蓋）がボトル（容器）開口部のドーナツ型上縁によく押さえつけられていなかったため、（2）斜めキャップ締めでアルミシールの浮いている部分があったため、（3）ボトル（開口部のドーナツ型上縁）のアルミシール接着面が平らでなくアルミシールにきちんと接触していなかったため、（4）アル

ミシール接着面に内容物が付着していたため、温度が充分に上昇しなかったため、(5)高周波シーラーの出力が大きすぎて温度が上昇し過ぎたため、(6)高周波シーラーの出力が小さすぎて温度が充分に上昇しなかったため、(7)高周波シーラーによる加熱がなかったため、(8)アルミシールが装着されていなかったため、(9)アルミシールが重なって装着されていたため、等々の様々な不具合原因を推定することができる。よって、この結果を用いて、コンベアを流れる内容物充填済みボトル(容器)のアルミシール接着の良否判定をオンラインで全数を検査できるのである。

【0018】ドーナツの形状は樹脂製容器口部が円形であるにも拘わらず、実際生産工程で本発明を実施した場合、画面上では楕円形に映し出される。これは樹脂製容器の熱溶着シールが作動するベルトコンベア上で行われることに起因する。つまり、樹脂製容器は常に一定速度で移動しているので移動方向に押しつぶされた形状の楕円形ドーナツとして画面上に表れるためである。しかしながらこの楕円形の映像であっても解析また肉眼による判断に支障を及ぼすことはない。

【0019】赤外線画像のデータ処理によって得られるヒストグラムに基づいてアルミシールの良否の判定を行うことも、同様に、シール良好な場合のヒストグラムと検査対象品のヒストグラムを比較し、両者の一致の程度するかどうかでシールの良否を判断する。

【0020】その画像またはヒストグラムが良好にシールされた製品(良品)の画像またはヒストグラムと照合して一致しないためにシール不良と判定された製品(不良品)をベルトコンベアの製造ラインから除去するには、ディスプレイの画像を監視してシール不良の画像が表れたら若しくは前記照合を機械的自動的に行わせて不良品の場合はディスプレイ上にNo Goodと表示させるようにしておいて、No Goodと表示されたら当該不良品をマニュアル的にラインから取り除くことで行うこともできるが、また、機械的自動的に行わせた前記照合の結果を不良品排除装置の駆動用信号に変換して自動的に不良品排除を行うこともできる。

【0021】一方、画面上に映し出された映像の温度分布データ解析に於いて、1)(異常高温)計測された全温度のうち、一定以上の高温値の検出、2)(シール部異常形状)樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状の長軸及び単軸方向の長さの比又は形状異常による検出、3)(シール温度分布)樹脂製容器開口部のドーナツ形状上縁に形成された熱溶着部ドーナツ形状の樹脂製容器の流れ方向の中心線の温度分布検出、4)(シール温度変化率)樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状のドーナツ形中心線の温度分布検出の少なくとも一つを用いるか又複数を組み合わせて用いることができる。

10

20

30

40

50

【0022】上述の1): (異常高温) 計測された全温度のうち、一定以上の高温値の検出の目安は樹脂製容器の材質とアルミシール部材に用いる合成樹脂成形部材との組み合わせで決定される。一般的には高密度ポリエチレンを合成樹脂成形部材にポリエチレンを用いる場合、それぞれの融点はメーカーにより差はあるが概ね120~140℃、107~120℃であるので最大温度は140℃である。一方、高周波発振による加熱で発生した熱はキャップ内天面からキャップ外側上面に伝わる。赤外線熱画像カメラはこのキャップ上面の温度を計測するため熔融温度はキャップへの熱伝導を通して測定されることになる。従って、計測される温度は熔融温度より比べかなり低温度で測定される。実際にはどの程度キャップ外側の見かけの温度が熔融温度より低く検出されるかはキャップの材質、構造、高周波アルミシール条件(室温、高周波発振時間、樹脂製容器移動速度等)によって異なってくる。従って、異常高温値を何度に設定するかはその都度検討し決定する必要がある。

【0023】上述の2): (シール部異常形状) 樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状の長軸及び単軸方向の長さの比又は形状異常による検出をより具体的に説明する。枠に載置された樹脂製容器はベルトコンベア上を移動しているのでシール性状態の検出のため赤外線画像解析CRT画面に映し出された映像は移動方向Y軸が移動に直角なX軸に比べ短い。従ってX/Y比を一定値幅以内とするかX及びY値各々の上限と下限を設定する検査が可能である。

【0024】上述の3): (シール温度分布) 樹脂製容器開口部のドーナツ形状上縁に形成された熱溶着部ドーナツ形状の樹脂製容器の流れ方向の中心線の温度分布検出はドーナツ状の肉部と空洞部で温度分布が異なることから樹脂製容器の流れ方向の中心線の温度分布を横軸に温度、縦軸に度数をするグラフに示せば2つの極大値を持つ曲線となり、このパターンをメモリーに記憶させておき実測値と比較させることで検出出来る。

【0025】上述の4): (シール温度変化率) 樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状のドーナツ形中心線の温度分布検出は主にドーナツ形状の断線つまり熱溶着していない破断部分を検出するのに都合が良い。CRT画面上にX軸はドーナツ形中心線に沿って0~360度とし、Y軸は温度を記録する。曲線がX軸に平行な直線又は緩い曲線を示せば温度の急激な変化(破断地帯)はないと見なすことが出来る。

【0026】本発明による検査システムの1例を図3に示す。

【0027】コンベアの移動が速くてラインスピード(ボトル/分)が大きいたときは、このような速度でも先に説明した上蓋上面の温度分布をよくキャッチできるよ

うな高速熱画像解析装置を採用するとよいことはいうまでもない。

【0028】また、コンベアの移動速度が速くて容器移動速度も大きくなり、そのために容器の蓋の進行方向前面が冷え、その結果得られる赤外線熱画像がシール良好の時でもきれいなドーナツ形にならないときは、シール良好なものの熱画像を基準とし、これと検査対象品の熱画像とを照合することでシールの良否を判定することのできることは、これまたいうまでもない。

【0029】

【実施例】以下、実施例により本発明を更に説明する。

【0030】（樹脂製容器及び高周波シール部材の準備と組み込み）樹脂製容器開口部のドーナツ形状上縁に合成樹脂成形部材／接着剤／アルミニウム箔／セロファン薄膜を積層したアルミシール積層材（総厚さ30 μ m）を中蓋とし、これをねじ込み式の赤色の樹脂製外蓋で前記容器開口部上縁に巻締めトルク7.5kg/cmで圧接し、試験用サンプルとした。樹脂製容器は容量250g入り、400g入り、600g入り、1000g入りで中身にマヨネーズを充填した各種容器を各5000本用意した。樹脂製外蓋はこの他に黄、橙及び白各種用意した。

【0031】（高周波シールとシール状態の撮影）前記準備した樹脂製容器をベルトコンベア上で安定させるための枠に載置し、これを530cm/sで移動させ、高周波発振器（島田理化（株）製「SST-20」）のコイル下一定位置を維持して水方向に移動させた。この状態で出力89～106V、55～75Aで高周波誘導加熱に付して前記アルミニウム箔の発熱により、下面に圧接された合成樹脂成形部材を部分熔融して前記容器開口部ドーナツ形状上縁に加熱融着させた。前記高周波誘導加熱処理に引き続いて前記キャップ上面を赤外線熱画像カメラで撮影し、得られたTV画面上にドーナツ形の温度分布映像を映し出した。

【0032】（解析項目）

1）（異常高温）

計測された全温度のうち、一定以上の高温値の検出、

2）（シール部異常形状）

樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状の長軸及び単軸方向の長さの比又は形状異常による検出、

3）（シール温度分布）

樹脂製容器開口部のドーナツ形状上縁に形成された熱溶着部ドーナツ形状の樹脂製容器の流れ方向の中心線の温度分布検出、

4）（シール温度変化率）

樹脂製容器開口部のドーナツ形状上縁に溶着された合成樹脂成形部材のドーナツ形状のドーナツ形中心線の温度分布検出を1）～4）を同時に行った。

【0033】（解析結果）CRT画面の映像から肉眼でドーナツ状の温度分布をカラフルに映像化することができた。これで肉眼でも瞬間的に判断することができた。更に精度を期すために上記解析項目を全サンプルについて検出し、データを記憶させた。実際の工程分析には上記解析項目に照らして異常値を検出した場合にそのサンプルについて、コンピュータに記憶させたデータを引き出し、異常原因を解析し、直ちに、その後の対策をとることができる。解析項目1）：異常高温で検出された例は高周波シールした後再度高周波シールを意図的に行った場合に検出された。アルミ箔の一部と樹脂製容器口部上縁の一部がゆるみ、キャップ、あるいは斜めキャップのため部分的に点接触したような状態でその部分の異常高温を検出した。解析項目2）：シール部異常形状は樹脂製容器の送り込み、移動速度の異常。解析項目3）：（シール温度分布）からアルミシール積層材をセットしなかった場合、二重にアルミシール積層材をセットした場合に異常低温を検出した。解析項目4）：（シール温度変化率）はシール部分の一部がシールされていなかった場合に検出した。

【0034】

【発明の効果】本発明によれば、樹脂製容器（ボトル）に内容物を充填し、アルミシール積層材（中蓋）を外蓋内天面に接してこれに装着し、高周波シーラー出力下を通過させ、アルミシール積層材下層の合成樹脂成形部材と該容器開口部上縁に融着させた際の融着シールの良否が簡便にしかも全数検査が極めて容易に行うことができ、品質管理を極めて効率的かつ効果的行うことができる。

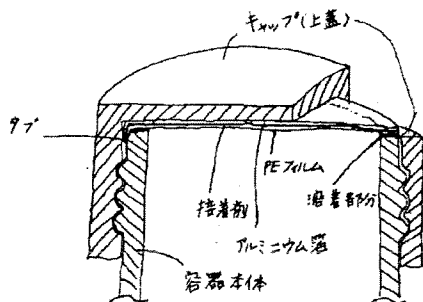
【図面の簡単な説明】

【図1】本発明の高周波シールのシール部分を示す切開図を示す。

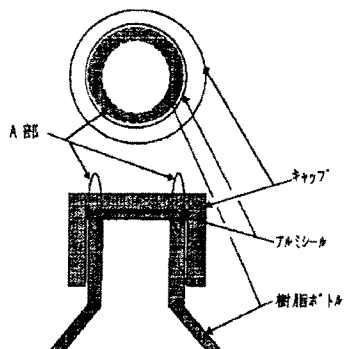
【図2】アルミシール加熱時のキャップ（外蓋）上面への熱伝導とその赤外線画像ヒストグラムを示す。

【図3】本発明による検査システムの1例を示す。

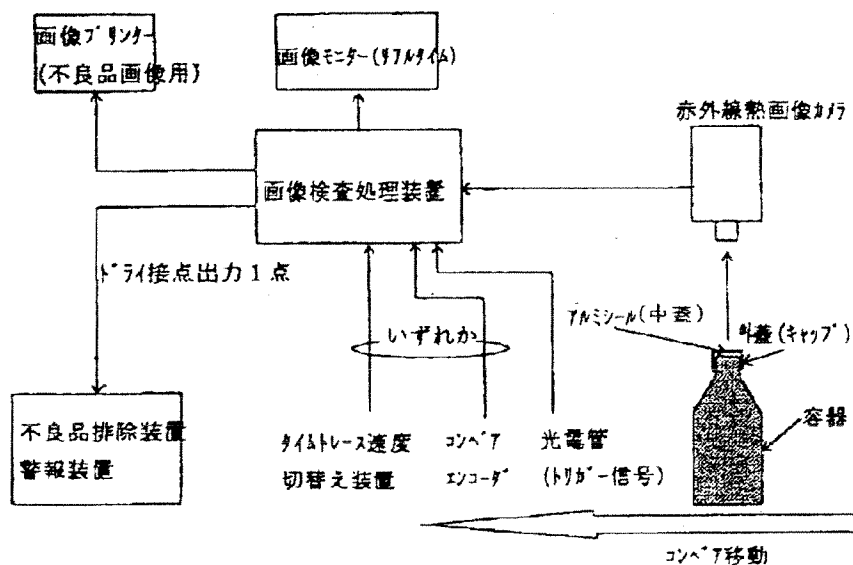
【図1】



【図2】



【図3】



フロントページの続き

(72) 発明者 橘 孝六
東京都中央区京橋1-15-1 味の素株式会社内
(72) 発明者 荒張 容周
神奈川県川崎市高津区下野毛2-12-1
クノール食品株式会社内

(72) 発明者 熊田 武夫
神奈川県川崎市高津区下野毛2-12-1
クノール食品株式会社内
(72) 発明者 木 雅夫
神奈川県川崎市川崎区鈴木町1-1 味の素株式会社生産技術研究所内

【公報種別】特許法第17条の2の規定による補正の掲載
【部門区分】第6部門第1区分
【発行日】平成14年4月26日(2002.4.26)

【公開番号】特開平10-318955
【公開日】平成10年12月4日(1998.12.4)
【年通号数】公開特許公報10-3190
【出願番号】特願平9-124167
【国際特許分類第7版】

G01N 25/72

【F I】

G01N 25/72 Y

【手続補正書】

【提出日】平成14年1月28日(2002.1.28)

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】特許請求の範囲

【補正方法】変更

【補正内容】

【特許請求の範囲】

【請求項1】樹脂製容器開口部のドーナツ形状上縁に少なくとも合成樹脂成形部材とその上にアルミニウム箔等の金属片の中蓋を置き、これをねじ込み式の樹脂製外蓋で前記容器開口部上縁に圧接し、この状態で高周波誘導

加熱に付して前記金属片の発熱により、下面に圧接された合成樹脂成形部材を部分溶解して前記容器開口部ドーナツ形状上縁に加熱融着させた場合に、前記高周波誘導加熱処理に引き続いて前記キャップ上面を赤外線熱画像カメラで撮影し、得られた赤外線熱画像の形状及び／又はデータ解析に基づいてアルミシールの良否を判定することを特徴とする高周波アルミシールの非接触検査法。

【請求項2】中蓋が少なくとも合成樹脂成形部材とその上にアルミニウム箔等の金属片が接着剤で接着された中蓋であることを特徴とする請求項1記載の高周波アルミシールの非接触検査法。

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-318955

(43)Date of publication of application : 04.12.1998

(51)Int.Cl.

G01N 25/72

(21)Application number : 09-124167

(71)Applicant : KUNOOLE SHOKUHHN KK
AJINOMOTO CO INC

(22)Date of filing : 14.05.1997

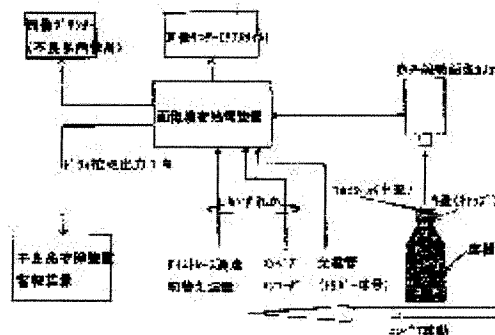
(72)Inventor : KURATANI TAKAHIRO
TACHIBANA KOROKU
ARABARI YOUSHIYUU
KUMADA TAKEO
ICHIKI MASAO

(54) NONCONTACT INSPECTION METHOD FOR FREQUENCY ALUMINUM SEAL

(57)Abstract:

PROBLEM TO BE SOLVED: To detect a defect of a seal conveniently by picking up the image of the upper surface of a thermally fused outer cover by means of an infrared thermal image camera and making a decision whether a seal is defective or not based on the shape of the image and the analysis of data.

SOLUTION: A synthetic resin molding member laminated on the lower surface is fused by heat generated an aluminum seal through high frequency oscillation to seal the doughnut type upper edge at the mouth of a container. The generated heat is transmitted the rear top surface of an outer cover to the outer upper surface. The heat distribution is picked up from above by means of an infrared thermal image camera and processed by an image inspection processor to determine the temperature distribution on the outer upper surface of the outer cover which is then displayed in color or subjected to histogram analysis and compared with that of a product sealed well. A decision is made that the seal is acceptable if they match each other otherwise a decision is made that the seal is rejectable and an abnormal value is detected. According to the method, 100% inspection of fusion seal can be made conveniently and easily and quality control can be performed quite efficiently and effectively.



CLAIMS

[Claim(s)]

[Claim 1] A middle lid of metal pieces, such as aluminium foil, is put on an anchor ring-like upper limb of a resin made container opening a synthetic resin molding member and on it at least, In this state, weld this by pressure to said container opening upper limb with an outer cover made of resin of a screwed type, give high-frequency induction heating, and by generation of heat of said metal piece. When liquation of the synthetic resin molding member welded by pressure to the undersurface is carried out and said container opening anchor ring-like upper limb is made to carry out heating weld, Non-contact detection method of a high frequency aluminum seal judging a quality of an aluminum seal based on shape and/or data analysis of an infrared thermal image which were obtained by photoing said cap upper surface with an infrared thermal image camera succeedingly to said high-frequency-induction heat-treatment.

[Claim 2] Non-contact detection method of the high frequency aluminum seal according to claim 1, wherein middle lids are a synthetic resin molding member and a middle lid which metal pieces, such as aluminium foil, pasted up with adhesives on it at least.

[Claim 3] Detection of an elevated-temperature value of the total temperature by which 1 measurement of the data analysis was carried out, and more than fixed, 2) Detection by a ratio or an abnormal shape of a major axis of the shape of an anchor ring of a synthetic resin molding member, and monopodium lay length welded by anchor ring-like upper limb of a resin made container opening, 3) Temperature distribution detection of a center line of a flow direction of a resin made container of the shape of a heat welding anchor ring formed in an anchor ring-like upper limb of a resin made container opening, 4) Non-contact detection method of the high frequency aluminum seal according to claim 1 using at least one of the temperature distribution detection of an anchor ring center line of the shape of an anchor ring of a synthetic resin molding member welded by anchor ring-like upper limb of a resin made container opening.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention -- the non-contact detection method of a high frequency aluminum seal -- in more detail, The container inner lid which comprises aluminium foil and a synthetic resin molding member at least by high-frequency induction heating. It is related with the non-contact detection method of the high frequency aluminum seal judged from the histogram directly produced from the infrared thermal image which can acquire the quality of the seal at the time of carrying out a seal from the outer cover upper surface by carrying out data processing of such an infrared thermal image with aluminium foil.

[0002]

[Description of the Prior Art] Conventionally, JP,62-28650,A "inspection method of foreign-matter-adhesion existence" and JP,7-101423,A "container adhesion test equipment" are known

by the detection method using infrared rays, for example. If it explains in full detail, the former will judge indirectly adhesion of packing to the container top-cover inner surface of the blister package product of foodstuffs automatically by giving a thermal change from the exterior to an inspected thing, and measuring the temperature gradient produced since the foreign-matter-adhesion part of an inspected thing is different calorific capacity from other parts with an infrared detector.

And the latter enables the inspection of the adhesive agent of the adhesion part of a container by non-contact from a way outside a container by detecting the infrared rays emitted from the upper surface and both side surfaces of the container which has a hot melt adhesive part with an infrared ray radiation thermometer.

Although these are common in this invention in the point of using an infrared thermal image, they completely differ from this invention so that I may be understood from the place explained later from the object (inspection point) of an inspection, a difference of the infrared rays (source) to catch, etc.

[0003] Liquids, such as mayonnaise, a dressing, tomato ketchup, soy sauce, and sauce, Size is the large scale which amounts to 1 kg or more, and the resin made container (bottle) of nonmetallic construction material with a small capacity of 100g or less was filled up with smallness, and the powdery or granular seasoning has set the container opening to circulation with the gestalt same and carried out [the lid] with the cap made of resin of nonmetallic construction material (outer cover). To have a middle lid is desired from a point of the sanitary impression from which the standpoint on safe and consumers receive these products in a distribution process.

[0004] As such a middle lid, there is a seal method by heating of high-frequency-induction aluminium foil. Namely, the aluminium foil (it may be called an aluminum seal laminated material below) which laminated thermofusion nature resin films, such as a polyethylene film, via the adhesives layer, for example, It is a little larger than the outer diameter of a doughnut shape upper limb so that the doughnut shape upper limb of the opening of the container filled up with contents may be covered (preferably). It cuts into the round shape which attached the tab so that it might be easy to remove, when removing a middle lid behind at the time of opening, The field of a thermal melting arrival nature resin film is turned for this cut piece down, a container opening is covered, and it is from this (preferably). The outer cover made of resin provided with the projected rim of doughnut shape which can weld aluminium foil by pressure to an inside bottom well to a container opening upper limb (cap) is screwed in, and it lets a high-frequency-induction-heating sealer pass in this state. The key map of the relation of each part is shown in drawing 1.

[0005] Thus, when it lets a high frequency sealer pass, an eddy current flows into the rim inner part of the circular cut piece of aluminium foil, and the foil of aluminum is heated by this eddy current. The cut piece (aluminum seal) of aluminium foil is pressed down with the outer cover (cap) (projected rim provided in the inside bottom) in the doughnut shape upper limb of the bottle (container) opening, The heat generated with the aluminum seal melts resin of the bottle of a portion (portion of A of drawing 2) in which the aluminum seal touches, and the resin which

melted in natural air cooling behind becomes hard. By this, an aluminum seal (middle lid) pastes a bottle opening, and the product which has become tight on it is completed.

[0006]However, high-frequency-induction heat sealing performed by doing in this way, It is not not necessarily always carried out good and The slack of a cap (top cover), The imperfect defective seal the two-sheet pile of a slanting cap and aluminum seal and cooking temperature are too low, and cooking temperature is too high, and according to the reason of adhesion of the contents (contents) to a seal part, an end chip of a sealing surface, aluminum seal nothing, and ** may arise.

[0007]For example, using a band conveyor, then, restoration of the contents (contents) to a resin made container, Put the circular middle lid of aluminium foil on the anchor ring upper limb of a container opening, and this is welded by pressure to said container opening upper limb with the outer cover (cap) of a screwed type, High-frequency induction heating can be given in this state, and a product with the above imperfect seals can be detected simple on the factory line which manufactures continuously the product which sealed said aluminium foil with carrying out high-frequency-induction-heating weld to said container opening upper limb, To be able to eliminate such a product (inferior goods) is desired strongly.

[0008]

[Problem(s) to be Solved by the Invention]Therefore, an object of this invention is to provide the method of detecting the defect in a high frequency aluminum seal which was explained above simple under the background of conventional technology given in the preceding clause.

[0009]

[Means for Solving the Problem]this invention person carries wholeheartedly a lid (outer cover) which put an aluminum seal middle lid into a resin made container opening anchor ring-like upper limb as a result of research that the purpose given in the preceding clause should be attained, When passing the bottom of a high frequency sealer, carrying out non-contact heating of the aluminum seal laminated material and making lower layer thermofusion nature resin of them weld to a container mouth part anchor ring upper limb, heat generated in an aluminum seal foil gets across to the outer surface through an outer cover, a fusion zone, i.e., a seal situation, of the shape of this anchor ring, but. Signs that heat conduction was carried out are incorporated by non-contact as an infrared thermal image with an infrared camera, This is reproduced with a picture inspection processor, temperature distribution of a top-cover outside surface is reproduced in a color, and it finds out that an aluminum seal can distinguish easily whether it pasted up in the good state from this shape and analyzed data, and came to complete this invention based on such knowledge.

[0010]Namely, this invention puts a middle lid of metal pieces, such as aluminium foil, on an anchor ring-like upper limb of a resin made container opening a synthetic resin molding member and on it at least, In this state, weld this by pressure to said container opening upper limb with an outer cover made of resin of a screwed type, give high-frequency induction heating, and by generation of heat of said metal piece. When liquation of the synthetic resin molding member welded by pressure to the undersurface is carried out and said container opening anchor ring-like

upper limb is made to carry out heating weld, It is the non-contact detection method of a high frequency aluminum seal judging a quality of an aluminum seal based on shape and/or data analysis of an infrared thermal image which were obtained by photoing said cap upper surface with an infrared thermal image camera succeedingly to said high-frequency-induction heat-treatment.

[0011]

[Embodiment of the Invention]Hereafter, this invention is explained in detail.

[0012]The middle lid of metal pieces (aluminum seal laminated material), such as aluminium foil, is put on the doughnut shape upper limb of a resin made container opening a synthetic resin molding member and on it, This can be welded by pressure to said container opening upper limb with the outer cover made of resin of a screwed type (cap), and carrying out high-frequency-induction-heating weld to said container opening upper limb itself can depend suitably the synthetic resin molding member which gave high-frequency induction heating in this state, and was located in the undersurface of said aluminium foil on a conventional method.

[0013]carrying out data processing of the thermal image obtained by photoing the objective surface with the infrared thermal image camera, and displaying the temperature distribution of the surface of said object in a color (a hot section -- red.) Displaying a low temperature part in blue and displaying pars intermedia like yellow or with a histogram, . The device which consists of systems, such as a commercial infrared camera, data processing, and a display, can be used suitably. for example, the NEC Corp. infared radiation thermometer "thermostat marker" Mitsubishi Electric Corp. high-speed thermal image analysis device "Mitsubishi thermal imager". A Nippon Avionics Co., Ltd. infrared thermal image device (TVS series), the JEOL Co., Ltd. infrared temperature analysis device "thermostat viewer" (JTG-6000 series), etc.

[0014]The high-frequency oscillator used by this invention can use a commercial device. For example, "high-frequency-oscillator SST-20" by SPC Electronics CORP. is fond, and it is used.

[0015]With the heat generated in the metal piece (aluminium foil) by high frequency oscillation, the feature of this invention. The heat generated when a part of synthetic resin molding member laminated by this metal piece undersurface fused and the seal of the anchor ring upper limb of the resin made container regio oralis was carried out, The heat distribution by which heat conduction was carried out to the outer cover outside top face through the outer cover reverse side top panel is caught with an infrared thermal image camera from the upper part, The obtained infrared thermal image data is processed, and the colored presentation of the temperature distribution of an outer cover outside top face is carried out, or histogram analysis is conducted (incidentally the display by these data processing). It judges with that it is well known that it may be carried out in real time, and a seal being good if in agreement as compared with them in the case of the product by which the seal was carried out good based on these displays or analyses, And if not in agreement, it is in inspecting sealing nature in non-contact by setting up judging with a sealing failure, and the data which serves as a standard again, and detecting an abnormal value.

[0016]Drawing 2 explains this more concretely. Drawing 2 shows heat conduction on the upper

surface of a cap (outer cover) at the time of aluminum seal heating, and the HISUTO graph which caught this with the infrared thermal image camera toward the cap from the upper part. When the heat generated with the aluminum seal gets across also to the portion (portion of A of drawing 2) of a cap and is seen with an infrared thermal image camera from the cap upper part, it is understood that the temperature of an anchor ring-like portion is higher than the temperature of the doughnut inside. A sealing nature adhesion situation can be judged quite correctly in the form of temperature distribution.

[0017] That is, when the form of a beautiful doughnut as shown in drawing 2 is observed (however, when the tab is attached to the middle lid of aluminium foil) When it can judge that some chip by it goes into the rim of a doughnut shape picture, and that the good aluminum seal was given and the other form is observed, Since (1) cap (outer cover) did not fully become tight and the aluminum seal (middle lid) was not often suppressed to the doughnut shape upper limb of a bottle (container) opening by a form, (2) Since there was a portion in which the aluminum seal has floated with the slanting cap bundle, (3) Since the aluminum seal adhesion side of the bottle (doughnut shape upper limb of an opening) was not even and did not touch an aluminum seal exactly, (4) Since contents had adhered to the aluminum seal adhesion side and temperature did not fully rise, (5) Too greatly [the output of a high frequency sealer], it can go up too much and temperature can be folded, (6) Since the output of the high frequency sealer was too small and temperature did not fully rise, (7) Since (9) aluminum seal lapped since there was no heating by a high frequency sealer and it was not equipped with (8) aluminum seal, and it was equipped, various defect causes of ** can be presumed. Therefore, total can be inspected for the quality decision of aluminum seal adhesion of the bottle (container) which flows through a conveyor filled [contents] up on-line using this result.

[0018] Although the shape of a doughnut has the circular resin made container regio oralis, when this invention is actually carried out by a production process, it is projected on an ellipse form on a screen. This originates in being carried out on the band conveyor on which the hot welding seal of a resin made container operates. That is, it is for appearing on a screen as an ellipse form doughnut of the shape crushed in the move direction, since the resin made container is always moving with constant speed. However, even if it is an image of this ellipse type, trouble is not exerted on analysis and judgment by a naked eye.

[0019] Similarly, judging the quality of an aluminum seal based on the histogram obtained by data processing of an infrared image also compares a histogram when a seal is good with the histogram of elegance to be examined, and it judges [of both coincidence] the quality of a seal by whether a grade is carried out.

[0020] Since the picture or histogram compares with the picture of a product (excellent article) or histogram by which the seal was carried out good and it is not in agreement, in order to remove the product (inferior goods) judged to be a sealing failure from the production line of a band conveyor, When the picture of a display is supervised and the picture of a sealing failure appears, make said collation perform mechanically automatically and it is made to make it display it as No Good on DIPUREI in the case of inferior goods, If displayed as No Good, the inferior goods

concerned can also be performed by removing from a line in manual, but the result of said mechanical collation made to perform automatically can be changed into the signal for a drive of an inferior-goods scavenging unit, and inferior-goods exclusion can also be performed automatically.

[0021]The inside of the total temperature by which 1 (abnormally high temperature) measurement was carried out on the other hand in the temperature-distribution-data analysis of the image projected on the screen, Detection by the ratio or abnormal shape of the major axis of detection of the elevated-temperature value more than fixed, and the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of 2 (seal part unusual shape) resin-made-container opening, and monopodium lay length, 3) (seal temperature distribution) Temperature distribution detection of the center line of the flow direction of the resin made container of the shape of a heat welding anchor ring formed in the anchor ring-like upper limb of a resin made container opening, 4) (seal temperature change rates) It can use again combining plurality, using at least one of the temperature distribution detection of the anchor ring center line of the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of the resin made container opening.

[0022]Above-mentioned 1: (abnormally high temperature) The rule of thumb of detection of the elevated-temperature value more than fixed is determined among the measured total temperature in the combination of the construction material of a resin made container, and the synthetic resin formation member used for an aluminum sealing member. Since a difference generally has each melting point by a maker in high density polyethylene when using polyethylene for a synthetic resin formation member, but it is 120-140 ** and 107-120 ** in general, the maximum temperature is 140 **. on the other hand, the heat generated with heating by high frequency oscillation is alike, and is transmitted from the top panel in a cap to a cap outside top face. In order that an infrared thermal image camera may measure the temperature on this upper surface of a cap, melting temperature will be measured through heat conduction to a cap. Therefore, the temperature measured is measured from melting temperature and is considerably measured with the degree of low temperature. How many [actual] temperature of the appearance of the cap outside are detected lower than melting temperature changes with the construction material of a cap, structure, and high frequency aluminum seal conditions (a room temperature, high frequency oscillation time, resin made container movement speed, etc.). Therefore, it is necessary to examine each time as what times an abnormally-high-temperature value is set, and to determine it.

[0023]Above-mentioned 2: (seal-part unusual shape) Explain more concretely detection by the ratio or abnormal shape of the major axis of the shape of an anchor ring of a synthetic resin molding member, and monopodium lay length welded by the anchor ring-like upper limb of the resin made container opening. Since the resin made container laid in the hakama is moving in the band-conveyor top, the image projected on the infrared image analysis CRT picture for detection of a sealing nature state has the short move direction Y-axis compared with the X-axis right-angled to movement. therefore, the inspection which carries out a X/Y ratio in less than fixed

range of prices, or sets up X, and the maximum of each Y value and a minimum is possible.

[0024]Above-mentioned 3 : (seal temperature distribution) since temperature distribution detection of the center line of the flow direction of the resin made container of the shape of a heat welding anchor ring formed in the anchor ring-like upper limb of a resin made container opening differs [of doughnut shape / the meat part and hollow part] in temperature distribution, the temperature distribution of the center line of the flow direction of a resin made container. It is detectable by becoming a curve with the two maximal value, if shown in the graph which sets a horizontal axis as temperature and sets a vertical axis as frequency, making the memory memorize this pattern, and making it compare with an actual measurement.

[0025]Above-mentioned 4: (seal temperature change rates) Temperature distribution detection of the anchor ring center line of the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of the resin made container opening is convenient for mainly detecting, anchor ring-like an open circuit, i.e., the fracture portion which has not carried out hot welding. On a CRT picture, the X-axis considers it as 0 to 360 degrees in accordance with an anchor ring center line, and a Y-axis records temperature. If a straight line with a curve parallel to the X-axis or a loose curve is shown, it can be considered that there is no abrupt change (fracture zone) of temperature.

[0026]One example of the inspection system by this invention is shown in drawing 3.

[0027]Movement of a conveyor is quick, and when line speed (a part for bottle/) is large, it cannot be overemphasized that it is good to adopt the high-speed thermal image analysis device which can catch well the temperature distribution on the upper surface of a top cover previously explained also at such a speed.

[0028]The movement speed of a conveyor is quick, and container movement speed also becomes large, therefore the front face of a direction of movement of the lid of a container gets cold, It can come that the quality of a seal can be judged by comparing this and the thermal image of elegance to be examined on the basis of the thermal image of what has a good seal when the seal of the infrared thermal image obtained as a result is good and it does not become a beautiful anchor ring, and it cannot be overemphasized again.

[0029]

[Example]Hereafter, an example explains this invention further.

[0030](Preparation and inclusion of a resin made container and a high frequency sealing member) The aluminum seal laminated material (total thickness of 30 micrometers) which laminated a synthetic resin molding member / adhesives / aluminium foil / cellophane thin film to the anchor ring-like upper limb of the resin made container opening is used as a middle lid, This was welded by pressure to said container opening upper limb by volume fastening torque 7.5 kg/cm with the red outer cover made of resin of the screwed type, and it was considered as the sample for an examination. As for the resin made container, the capacity of 250g entered, it entered 400g, entered 600g, and prepared each 5000 various containers which filled up mayonnaise into contents with entering 1000g. the outer cover made of resin -- in addition to this -- yellow and a sour orange -- and white various preparation was carried out.

[0031](Photography of a high frequency seal and a sealed condition) Said prepared resin made container is laid in the hakama for making it stabilized on a band conveyor, this is moved by 530 cm/s, and the bottom fixed position of a coil of the high-frequency oscillator ("SST-20" by SPC Electronics CORP.) was maintained, and was moved for Mizukata. Liquation of the synthetic resin molding member which gave high-frequency induction heating with the outputs 89-106V, 55-75A by this state, and was welded by pressure to the undersurface by generation of heat of said aluminium foil was carried out, and said container opening anchor ring-like upper limb was made to carry out heating weld. The temperature distribution image of the anchor ring was projected on the TV picture obtained by photoing said cap upper surface with an infrared thermal image camera succeedingly to said high-frequency-induction heat-treatment.

[0032](Analysis item)

1) (abnormally high temperature)

Detection of the elevated-temperature value of the measured total temperature and more than fixed, 2 (seal part unusual shape)

Detection by the ratio or abnormal shape of the major axis of the shape of an anchor ring of a synthetic resin molding member, and monopodium lay length welded by the anchor ring-like upper limb of the resin made container opening, 3 (seal temperature distribution)

Temperature distribution detection of the center line of the flow direction of the resin made container of the shape of a heat welding anchor ring formed in the anchor ring-like upper limb of a resin made container opening, 4 (seal temperature change rates)

1-4 were simultaneously performed for temperature distribution detection of the anchor ring center line of the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of the resin made container opening.

[0033](Analysis result) The temperature distribution of doughnut shape was able to be colorfully converted into a video signal with the naked eye from the image of the CRT picture. Also with the naked eye, it was able to judge momentarily now. In order to expect accuracy, the above-mentioned analysis item was detected about all the samples, and data was made to memorize. When an abnormal value is detected in the light of the above-mentioned analysis item for actual process analyses, about the sample, the data stored in the computer can be pulled out, an abnormality cause can be analyzed, and the measures against subsequent can be taken promptly. Analysis item 1: When a high frequency seal was again performed intentionally after carrying out the high frequency seal of the example detected by abnormally high temperature, it was detected. Some aluminum foil and a part of resin made container regio-oralis upper limb loosened, and where point contact is selectively carried out for a cap or a slanting cap, the abnormally high temperature of the portion was detected. Analysis item 2: Seal part unusual shape is sending of a resin made container and the abnormalities of movement speed. When an aluminum seal laminated material was not set from analysis item 3: (seal temperature distribution), and an aluminum seal laminated material was set doubly, abnormally low temperature was detected. It detected, when the seal of a part of seal part was not carried out as for analysis item 4: (seal temperature change rates).

[0034]

[Effect of the Invention]According to this invention, fill up a resin made container (bottle) with contents, and this is equipped with an aluminum seal laminated material (middle lid) in contact with the top panel in an outer cover, simple moreover the quality of the weld seal at the time of passing the bottom of a high frequency sealer output, and making it weld to the synthetic resin formation member and this container opening upper limb of an aluminum seal laminated material lower layer can carry out very easily [hundred percent inspection] -- a quality control - - very efficient and effective **** -- things are made.

TECHNICAL FIELD

[Field of the Invention]this invention -- the non-contact detection method of a high frequency aluminum seal -- in more detail, The container inner lid which comprises aluminium foil and a synthetic resin molding member at least by high-frequency induction heating. It is related with the non-contact detection method of the high frequency aluminum seal judged from the histogram directly produced from the infrared thermal image which can acquire the quality of the seal at the time of carrying out a seal from the outer cover upper surface by carrying out data processing of such an infrared thermal image with aluminium foil.

PRIOR ART

[Description of the Prior Art]Conventionally, JP,62-28650,A "inspection method of foreign-matter-adhesion existence" and JP,7-101423,A "container adhesion test equipment" are known by the detection method using infrared rays, for example. If it explains in full detail, the former will judge indirectly adhesion of packing to the container top-cover inner surface of the blister package product of foodstuffs automatically by giving a thermal change from the exterior to an inspected thing, and measuring the temperature gradient produced since the foreign-matter-adhesion part of an inspected thing is different calorific capacity from other parts with an infrared detector.

And the latter enables the inspection of the adhesive agent of the adhesion part of a container by non-contact from a way outside a container by detecting the infrared rays emitted from the upper surface and both side surfaces of the container which has a hot melt adhesive part with an infrared ray radiation thermometer.

Although these are common in this invention in the point of using an infrared thermal image, they completely differ from this invention so that I may be understood from the place explained later from the object (inspection point) of an inspection, a difference of the infrared rays (source) to catch, etc.

[0003]Liquids, such as mayonnaise, a dressing, tomato ketchup, soy sauce, and sauce, Size is the large scale which amounts to 1 kg or more, and the resin made container (bottle) of nonmetallic

construction material with a small capacity of 100g or less was filled up with smallness, and the powdery or granular seasoning has set the container opening to circulation with the gestalt same and carried out [the lid] with the cap made of resin of nonmetallic construction material (outer cover). To have a middle lid is desired from a point of the sanitary impression from which the standpoint on safe and consumers receive these products in a distribution process.

[0004]As such a middle lid, there is a seal method by heating of high-frequency-induction aluminium foil. Namely, the aluminium foil (it may be called an aluminum seal laminated material below) which laminated thermofusion nature resin films, such as a polyethylene film, via the adhesives layer, for example, It is a little larger than the outer diameter of a doughnut shape upper limb so that the doughnut shape upper limb of the opening of the container filled up with contents may be covered (preferably). It cuts into the round shape which attached the tab so that it might be easy to remove, when removing a middle lid behind at the time of opening, The field of a thermal melting arrival nature resin film is turned for this cut piece down, a container opening is covered, and it is from this (preferably). The outer cover made of resin provided with the projected rim of doughnut shape which can weld aluminium foil by pressure to an inside bottom well to a container opening upper limb (cap) is screwed in, and it lets a high-frequency-induction-heating sealer pass in this state. The key map of the relation of each part is shown in drawing 1.

[0005]Thus, when it lets a high frequency sealer pass, an eddy current flows into the rim inner part of the circular cut piece of aluminium foil, and the foil of aluminum is heated by this eddy current. The cut piece (aluminum seal) of aluminium foil is pressed down with the outer cover (cap) (projected rim provided in the inside bottom) in the doughnut shape upper limb of the bottle (container) opening, The heat generated with the aluminum seal melts resin of the bottle of a portion (portion of A of drawing 2) in which the aluminum seal touches, and the resin which melted in natural air cooling behind becomes hard. By this, an aluminum seal (middle lid) pastes a bottle opening, and the product which has become tight on it is completed.

[0006]However, high-frequency-induction heat sealing performed by doing in this way, It is not not necessarily always carried out good and The slack of a cap (top cover), The imperfect defective seal the two-sheet pile of a slanting cap and aluminum seal and cooking temperature are too low, and cooking temperature is too high, and according to the reason of adhesion of the contents (contents) to a seal part, an end chip of a sealing surface, aluminum seal nothing, and ** may arise.

[0007]For example, using a band conveyor, then, restoration of the contents (contents) to a resin made container, Put the circular middle lid of aluminium foil on the anchor ring upper limb of a container opening, and this is welded by pressure to said container opening upper limb with the outer cover (cap) of a screwed type, High-frequency induction heating can be given in this state, and a product with the above imperfect seals can be detected simple on the factory line which manufactures continuously the product which sealed said aluminium foil with carrying out high-frequency-induction-heating weld to said container opening upper limb, To be able to eliminate such a product (inferior goods) is desired strongly.

EFFECT OF THE INVENTION

[Effect of the Invention]According to this invention, fill up a resin made container (bottle) with contents, and this is equipped with an aluminum seal laminated material (middle lid) in contact with the top panel in an outer cover, simple moreover the quality of the weld seal at the time of passing the bottom of a high frequency sealer output, and making it weld to the synthetic resin formation member and this container opening upper limb of an aluminum seal laminated material lower layer can carry out very easily [hundred percent inspection] -- a quality control - very efficient and effective **** -- things are made.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Therefore, an object of this invention is to provide the method of detecting the defect in a high frequency aluminum seal which was explained above simple under the background of conventional technology given in the preceding clause. **MEANS**

[Means for Solving the Problem]this invention person carries wholeheartedly a lid (outer cover) which put an aluminum seal middle lid into a resin made container opening anchor ring-like upper limb as a result of research that the purpose given in the preceding clause should be attained, When passing the bottom of a high frequency sealer, carrying out non-contact heating of the aluminum seal laminated material and making lower layer thermofusion nature resin of them weld to a container mouth part anchor ring upper limb, heat generated in an aluminum seal foil gets across to the outer surface through an outer cover, a fusion zone, i.e., a seal situation, of the shape of this anchor ring, but. Signs that heat conduction was carried out are incorporated by non-contact as an infrared thermal image with an infrared camera, This is reproduced with a picture inspection processor, temperature distribution of a top-cover outside surface is reproduced in a color, and it finds out that an aluminum seal can distinguish easily whether it pasted up in the good state from this shape and analyzed data, and came to complete this invention based on such knowledge.

[0010]Namely, this invention puts a middle lid of metal pieces, such as aluminium foil, on an anchor ring-like upper limb of a resin made container opening a synthetic resin molding member and on it at least, In this state, weld this by pressure to said container opening upper limb with an outer cover made of resin of a screwed type, give high-frequency induction heating, and by generation of heat of said metal piece. When liquation of the synthetic resin molding member welded by pressure to the undersurface is carried out and said container opening anchor ring-like upper limb is made to carry out heating weld, It is the non-contact detection method of a high frequency aluminum seal judging a quality of an aluminum seal based on shape and/or data analysis of an infrared thermal image which were obtained by photoing said cap upper surface

with an infrared thermal image camera succeeding to said high-frequency-induction heat-treatment.

[0011]

[Embodiment of the Invention] Hereafter, this invention is explained in detail.

[0012] The middle lid of metal pieces (aluminum seal laminated material), such as aluminium foil, is put on the doughnut shape upper limb of a resin made container opening a synthetic resin molding member and on it, This can be welded by pressure to said container opening upper limb with the outer cover made of resin of a screwed type (cap), and carrying out high-frequency-induction-heating weld to said container opening upper limb itself can depend suitably the synthetic resin molding member which gave high-frequency induction heating in this state, and was located in the undersurface of said aluminium foil on a conventional method.

[0013] carrying out data processing of the thermal image obtained by photoing the objective surface with the infrared thermal image camera, and displaying the temperature distribution of the surface of said object in a color (a hot section -- red.) Displaying a low temperature part in blue and displaying parts intermedia like yellow or with a histogram, . The device which consists of systems, such as a commercial infrared camera, data processing, and a display, can be used suitably. for example, the NEC Corp. infrared radiation thermometer "thermostat marker" Mitsubishi Electric Corp. high-speed thermal image analysis device "Mitsubishi thermal imager". A Nippon Avionics Co., Ltd. infrared thermal image device (TVS series), the JEOL Co., Ltd. infrared temperature analysis device "thermostat viewer" (JTG-6000 series), etc.

[0014] The high-frequency oscillator used by this invention can use a commercial device. For example, "high-frequency-oscillator SST-20" by SPC Electronics CORP. is found, and it is used.

[0015] With the heat generated in the metal piece (aluminium foil) by high frequency oscillation, the feature of this invention. The heat generated when a part of synthetic resin molding member laminated by this metal piece undersurface fused and the seal of the anchor ring upper limb of the resin made container region was carried out, The heat distribution by which heat conduction was carried out to the outer cover outside top face through the outer cover reverse side top panel is caught with an infrared thermal image camera from the upper part, The obtained infrared thermal image data is processed, and the colored presentation of the temperature distribution of an outer cover outside top face is carried out, or histogram analysis is conducted (incidentally the display by these data processing). It judges with that it is well known that it may be carried out in real time, and a seal being good if in agreement as compared with them in the case of the product by which the seal was carried out good based on these displays or analyses, And if not in agreement, it is in inspecting sealing nature in non-contact by setting up judging with a sealing failure, and the data which serves as a standard again, and detecting an abnormal value.

[0016] Drawing 2 explains this more concretely. Drawing 2 shows heat conduction on the upper surface of a cap (outer cover) at the time of aluminum seal heating, and the HISUTO graph which caught this with the infrared thermal image camera toward the cap from the upper part. When the heat generated with the aluminum seal gets across also to the portion (portion of A of

drawing 2) of a cap and is seen with an infrared thermal image camera from the cap upper part, it is understood that the temperature of an anchor ring-like portion is higher than the temperature of the doughnut inside. A sealing nature adhesion situation can be judged quite correctly in the form of temperature distribution.

[0017] That is, when the form of a beautiful doughnut as shown in drawing 2 is observed (however, when the tab is attached to the middle lid of aluminium foil) When it can judge that some chip by it goes into the rim of a doughnut shape picture, and that the good aluminum seal was given and the other form is observed, Since (1) cap (outer cover) did not fully become tight and the aluminum seal (middle lid) was not often suppressed to the doughnut shape upper limb of a bottle (container) opening by a form, (2) Since there was a portion in which the aluminum seal has floated with the slanting cap bundle, (3) Since the aluminum seal adhesion side of the bottle (doughnut shape upper limb of an opening) was not even and did not touch an aluminum seal exactly, (4) Since contents had adhered to the aluminum seal adhesion side and temperature did not fully rise, (5) Too greatly [the output of a high frequency sealer], it can go up too much and temperature can be folded, (6) Since the output of the high frequency sealer was too small and temperature did not fully rise, (7) Since (9) aluminum seal lapped since there was no heating by a high frequency sealer and it was not equipped with (8) aluminum seal, and it was equipped, various defect causes of ** can be presumed. Therefore, total can be inspected for the quality decision of aluminum seal adhesion of the bottle (container) which flows through a conveyor filled [contents] up on-line using this result.

[0018] Although the shape of a doughnut has the circular resin made container regio oralis, when this invention is actually carried out by a production process, it is projected on an ellipse form on a screen. This originates in being carried out on the band conveyor on which the hot welding seal of a resin made container operates. That is, it is for appearing on a screen as an ellipse form doughnut of the shape crushed in the move direction, since the resin made container is always moving with constant speed. However, even if it is an image of this ellipse type, trouble is not exerted on analysis and judgment by a naked eye.

[0019] Similarly, judging the quality of an aluminum seal based on the histogram obtained by data processing of an infrared image also compares a histogram when a seal is good with the histogram of elegance to be examined, and it judges [of both coincidence] the quality of a seal by whether a grade is carried out.

[0020] Since the picture or histogram compares with the picture of a product (excellent article) or histogram by which the seal was carried out good and it is not in agreement, in order to remove the product (inferior goods) judged to be a sealing failure from the production line of a band conveyor, When the picture of a display is supervised and the picture of a sealing failure appears, make said collation perform mechanically automatically and it is made to make it display it as No Good on DIPUREI in the case of inferior goods, If displayed as No Good, the inferior goods concerned can also be performed by removing from a line in manual, but the result of said mechanical collation made to perform automatically can be changed into the signal for a drive of an inferior-goods scavenging unit, and inferior-goods exclusion can also be performed

automatically.

[0021]The inside of the total temperature by which 1 (abnormally high temperature) measurement was carried out on the other hand in the temperature-distribution-data analysis of the image projected on the screen, Detection by the ratio or abnormal shape of the major axis of detection of the elevated-temperature value more than fixed, and the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of 2 (seal part unusual shape) resin-made-container opening, and monopodium lay length, 3) (seal temperature distribution) Temperature distribution detection of the center line of the flow direction of the resin made container of the shape of a heat welding anchor ring formed in the anchor ring-like upper limb of a resin made container opening, 4) (seal temperature change rates) It can use again combining plurality, using at least one of the temperature distribution detection of the anchor ring center line of the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of the resin made container opening.

[0022]Above-mentioned 1: (abnormally high temperature) The rule of thumb of detection of the elevated-temperature value more than fixed is determined among the measured total temperature in the combination of the construction material of a resin made container, and the synthetic resin formation member used for an aluminum sealing member. Since a difference generally has each melting point by a maker in high density polyethylene when using polyethylene for a synthetic resin formation member, but it is 120-140 ** and 107-120 ** in general, the maximum temperature is 140 **. on the other hand, the heat generated with heating by high frequency oscillation is alike, and is transmitted from the top panel in a cap to a cap outside top face. In order that an infrared thermal image camera may measure the temperature on this upper surface of a cap, melting temperature will be measured through heat conduction to a cap. Therefore, the temperature measured is measured from melting temperature and is considerably measured with the degree of low temperature. How many [actual] temperature of the appearance of the cap outside are detected lower than melting temperature changes with the construction material of a cap, structure, and high frequency aluminum seal conditions (a room temperature, high frequency oscillation time, resin made container movement speed, etc.). Therefore, it is necessary to examine each time as what times an abnormally-high-temperature value is set, and to determine it.

[0023]Above-mentioned 2: (seal-part unusual shape) Explain more concretely detection by the ratio or abnormal shape of the major axis of the shape of an anchor ring of a synthetic resin molding member, and monopodium lay length welded by the anchor ring-like upper limb of the resin made container opening. Since the resin made container laid in the hakama is moving in the band-conveyor top, the image projected on the infrared image analysis CRT picture for detection of a sealing nature state has the short move direction Y-axis compared with the X-axis right-angled to movement. therefore, the inspection which carries out a X/Y ratio in less than fixed range of prices, or sets up X, and the maximum of each Y value and a minimum is possible.

[0024]Above-mentioned 3 : (seal temperature distribution) since temperature distribution detection of the center line of the flow direction of the resin made container of the shape of a

heat welding anchor ring formed in the anchor ring-like upper limb of a resin made container opening differs [of doughnut shape / the meat part and hollow part] in temperature distribution, the temperature distribution of the center line of the flow direction of a resin made container. It is detectable by becoming a curve with the two maximal value, if shown in the graph which sets a horizontal axis as temperature and sets a vertical axis as frequency, making the memory memorize this pattern, and making it compare with an actual measurement.

[0025]Above-mentioned 4: (seal temperature change rates) Temperature distribution detection of the anchor ring center line of the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of the resin made container opening is convenient for mainly detecting, anchor ring-like an open circuit, i.e., the fracture portion which has not carried out hot welding. On a CRT picture, the X-axis considers it as 0 to 360 degrees in accordance with an anchor ring center line, and a Y-axis records temperature. If a straight line with a curve parallel to the X-axis or a loose curve is shown, it can be considered that there is no abrupt change (fracture zone) of temperature.

[0026]One example of the inspection system by this invention is shown in drawing 3.

[0027]Movement of a conveyor is quick, and when line speed (a part for bottle/) is large, it cannot be overemphasized that it is good to adopt the high-speed thermal image analysis device which can catch well the temperature distribution on the upper surface of a top cover previously explained also at such a speed.

[0028]The movement speed of a conveyor is quick, and container movement speed also becomes large, therefore the front face of a direction of movement of the lid of a container gets cold, It can come that the quality of a seal can be judged by comparing this and the thermal image of elegance to be examined on the basis of the thermal image of what has a good seal when the seal of the infrared thermal image obtained as a result is good and it does not become a beautiful anchor ring, and it cannot be overemphasized again.

EXAMPLE

[Example]Hereafter, an example explains this invention further.

[0030](Preparation and inclusion of a resin made container and a high frequency sealing member) The aluminum seal laminated material (total thickness of 30 micrometers) which laminated a synthetic resin molding member / adhesives / aluminium foil / cellophane thin film to the anchor ring-like upper limb of the resin made container opening is used as a middle lid, This was welded by pressure to said container opening upper limb by volume fastening torque 7.5 kg/cm with the red outer cover made of resin of the screwed type, and it was considered as the sample for an examination. As for the resin made container, the capacity of 250g entered, it entered 400g, entered 600g, and prepared each 5000 various containers which filled up mayonnaise into contents with entering 1000g. the outer cover made of resin -- in addition to this -- yellow and a sour orange -- and white various preparation was carried out.

[0031](Photography of a high frequency seal and a sealed condition) Said prepared resin made

container is laid in the hakama for making it stabilized on a band conveyor, this is moved by 530 cm/s, and the bottom fixed position of a coil of the high-frequency oscillator ("SST-20" by SPC Electronics CORP.) was maintained, and was moved for Mizukata. Liquation of the synthetic resin molding member which gave high-frequency induction heating with the outputs 89-106V, 55-75A by this state, and was welded by pressure to the undersurface by generation of heat of said aluminium foil was carried out, and said container opening anchor ring-like upper limb was made to carry out heating weld. The temperature distribution image of the anchor ring was projected on the TV picture obtained by photoing said cap upper surface with an infrared thermal image camera succeedingly to said high-frequency-induction heat-treatment.

[0032](Analysis item)

1) (abnormally high temperature)

detection of the elevated-temperature value of the measured total temperature and more than fixed, and 2 (seal part unusual shape)

Detection by the ratio or abnormal shape of the major axis of the shape of an anchor ring of a synthetic resin molding member, and monopodium lay length welded by the anchor ring-like upper limb of the resin made container opening, 3 (seal temperature distribution)

Temperature distribution detection of the center line of the flow direction of the resin made container of the shape of a heat welding anchor ring formed in the anchor ring-like upper limb of a resin made container opening, 4 (seal temperature change rates)

1-4 were simultaneously performed for temperature distribution detection of the anchor ring center line of the shape of an anchor ring of the synthetic resin molding member welded by the anchor ring-like upper limb of the resin made container opening.

[0033](Analysis result) The temperature distribution of doughnut shape was able to be colorfully converted into a video signal with the naked eye from the image of the CRT picture. Also with the naked eye, it was able to judge momentarily now. In order to expect accuracy, the above-mentioned analysis item was detected about all the samples, and data was made to memorize.

When an abnormal value is detected in the light of the above-mentioned analysis item for actual process analyses, about the sample, the data stored in the computer can be pulled out, an abnormality cause can be analyzed, and the measures against subsequent can be taken promptly.

Analysis item 1: When a high frequency seal was again performed intentionally after carrying out the high frequency seal of the example detected by abnormally high temperature, it was detected. Some aluminum foil and a part of resin made container regio-oralis upper limb loosened, and where point contact is selectively carried out for a cap or a slanting cap, the abnormally high temperature of the portion was detected. Analysis item 2: Seal part unusual shape is sending of a resin made container and the abnormalities of movement speed. When an aluminum seal laminated material was not set from analysis item 3: (seal temperature distribution), and an aluminum seal laminated material was set doubly, abnormally low temperature was detected. It detected, when the seal of a part of seal part was not carried out as for analysis item 4: (seal temperature change rates).

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The incision figure showing the seal part of the high frequency seal of this invention is shown.

[Drawing 2]Heat conduction and its infrared image histogram on the upper surface of a cap (outer cover) at the time of aluminum seal heating are shown.

[Drawing 3]One example of the inspection system by this invention is sh

CORRECTION OR AMENDMENT

[Kind of official gazette]Printing of amendment by the regulation of 2 of Article 17 of Patent Law

[Section classification] The 1st classification of the part VI gate

[Publication date]April 26 (2002.4.26), Heisei 14

[Publication No.]JP,10-318955,A

[Date of Publication]December 4 (1998.12.4), Heisei 10

[Annual volume number] Publication of patent applications 10-3190

[Application number]Japanese Patent Application No. 9-124167

[The 7th edition of International Patent Classification]

G01N 25/72

[FI]

G01N 25/72 Y

[Written amendment]

[Filing date]January 28 (2002.1.28), Heisei 14

[Amendment 1]

[Document to be Amended]Specification

[Item(s) to be Amended]Claim

[Method of Amendment]Change

[Proposed Amendment]

[Claim(s)]

[Claim 1]A middle lid of metal pieces, such as aluminium foil, is put on an anchor ring-like upper limb of a resin made container opening a synthetic resin molding member and on it at least, In this state, weld this by pressure to said container opening upper limb with an outer cover made of resin of a screwed type, give high-frequency induction heating, and by generation of heat of said metal piece. When liquation of the synthetic resin molding member welded by pressure to the undersurface is carried out and said container opening anchor ring-like upper limb is made to carry out heating weld, Non-contact detection method of a high frequency aluminum seal judging a quality of an aluminum seal based on shape and/or data analysis of an infrared thermal image which were obtained by photoing said cap upper surface with an infrared thermal image camera succeedingly to said high-frequency-induction heat-treatment.

[Claim 2]Non-contact detection method of the high frequency aluminum seal according to claim 1, wherein middle lids are a synthetic resin molding member and a middle lid which metal pieces, such as aluminium foil, pasted up with adhesives on it at least.

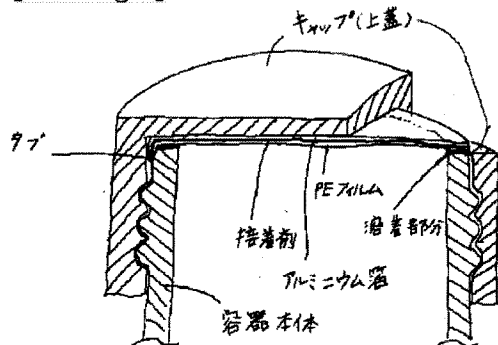
* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

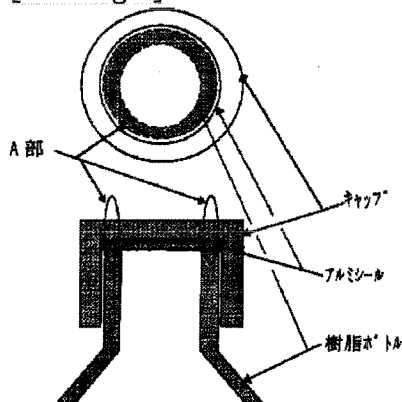
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.*** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

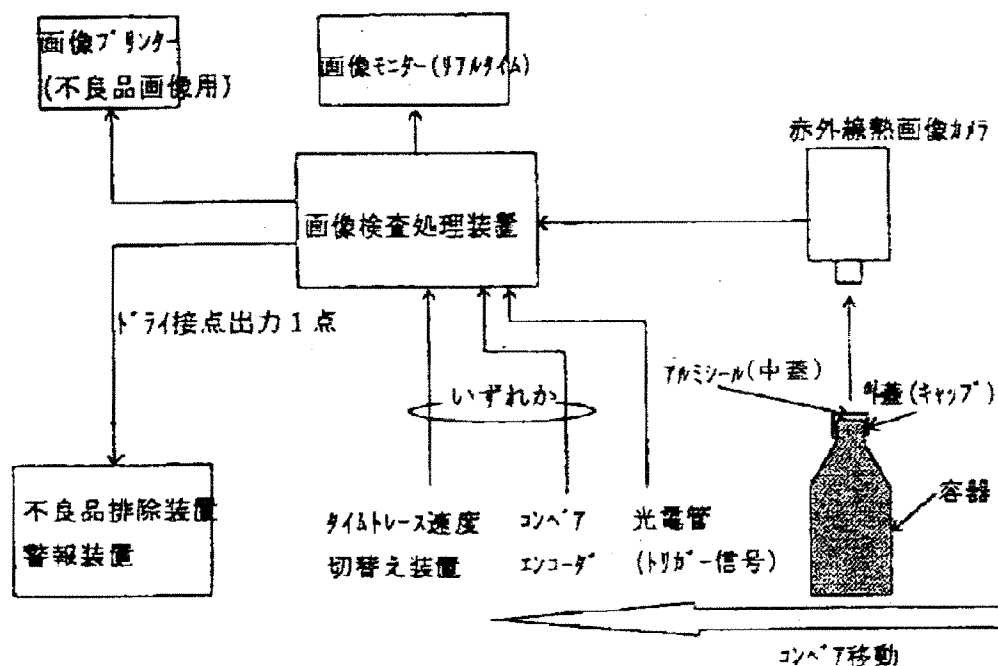
DRAWINGS

[Drawing 1]



[Drawing 2]





[Drawing 3] 1 / 1

[Translation done.]